Iowa School Buses & Biodiesel

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Biodiesel Basics

- A clean burning alternative fuel from transesterification or separation of vegetable oils or animal fats using methanol and a sodium or potassium hydroxide catalyst.
- Leaves two products: glycerin and methyl esters, the chemical name for biodiesel. Glycerin used for cosmetics, soaps.
- Meets ASTM D6751

Biodiesel Expansion

- In 2004, 30 million gallons used in U.S. (0.04% of U.S. diesel market.)
- Iowa produced 20M gallons last year with 75M gallons new production next year.
- At least five plants doing feasibility studies. Iowa could have 250-300M gal. new production in two years.

Biodiesel Benefits

- Renewable, domestic fuel supports local economy
- Less toxicity, biodegradable
- Higher lubricity
- Higher flashpoint (safer to store)
- Can be immediately used without engine modifications
- Can be used as B100 or blended with diesel
- Can be shipped, stored with diesel with same infrastructure

Emission Benefits

	B10	B100
CO	10%	50%
PM	15%	70%
HC	10%	40%
Sulfate	20%	100%
NOx	+2%	+9%

- Similar CO_2 tailpipe emissions, but 75% less during complete lifecycle as soybean plants uptake CO_2 during growth. Regular diesel releases stored carbon.

Iowans Early Adopters

- Iowans have less reluctance. Using ethanol since 1978. Ethanol has record 78% market share (255,000 barrels/ month. June had lowest sales of regular gasoline.)
- Farmers early users of B2, B5.
- Iowans leaders in soybean, biodiesel production
- Soy oil production has a large share of all vegetable and animal fat oils in the U.S.

BEEP

- Bus Emission Education Program (BEEP)
- BEEP Collaborative effort
  - School Administrators of Iowa, Iowa Department of Education, Iowa Association of School Boards, Iowa Pupil Transportation Association, Iowa Department of Natural Resources
- BEEP obtained $250,000 Clean School Bus USA grant from EPA. Mainly for diesel oxidation catalysts, also funds higher blend biodiesel for three school districts
- Credibility barrier overcome with partnership

Current Biodiesel Use in Schools

- At least 37 of 379 districts (ten percent) of Iowa school districts use biodiesel, many low blend B2-B5, some B10, B20.
- BEEP funding 3,760 gallons of B100 to three districts for B10, B20 and B100 use.
  - 14,000 gal. B10, Johnston CSD
  - 10,000 gal. B20 Ft. Madison CSD
  - 360 gal. B100 Nevada CSD
- Provides 2-6 percent of total diesel use for each district
- Half-price cost share by West Central Cooperative of Ralston, IA the biodiesel producer to extend grant funds.

Barriers

- Cold temperature use (Requires same cold-weather considerations as #2 diesel.)
- Price fluctuations, cost
- Availability

Biodiesel Costs

- Currently about same cost, often within $.05/gal.
- Price fluctuation due to high biodiesel demand, soy oil costs.
- Demand higher during non-winter months. Costs also higher.
- Suppliers cannot meet demand

Biodiesel Costs

- Current on-road diesel cost: $2.36 per gallon.
- B5 cost: $2.39 per gallon
- B100 cost $2.42 ($2.11 in April)

- Margin, handling and shipping costs, depending upon nearest availability, can add costs. Bulk purchases and or nearness to load-out facilities can reduce costs.

(Federal biodiesel blenders credit of $.01 per percent of biodiesel reflected in price.) For example, 20 cents per gallon for B20

Deliveries

- Nevada CSD splash blends and uses pre-blended (AST,UST)
- Ft. Madison CSD receives pre-blended B20 to UST
- Johnston CSD, uses in-line, mobile on-site refueling. Compartmental truck carries biodiesel and other diesel to refuel buses overnight twice weekly.

Nevada CSD

- Use B20 with #2 diesel fall to spring. Summertime B100.
- Winter: 40% No. 1 diesel, 40% No.2 diesel and 20% biodiesel. Splash blend into UST.
- No tank heaters. Buses exposed to overnight winter lows of -13 degrees F. with no starting issues.
- Spring, summer, fall B100 in indoor AST.

Nevada, IA Fuel Economy

- Using B20 (80% #2 Diesel and 20% B100) mileage is 9 mpg at Nevada CSD.
- A loss of 1-2 mpg occurs using B100
- A loss of 2 mpg occurs using pure #2 Diesel versus B20.

Maintenance

- Decreased soot in engines, injectors
- Less fuel filter and oil changes
  - "I can run my oil 10,000 miles according to the oil samples." Richard Scott, Nevada CSD
- Higher biodiesel lubricity gentler on engines
- Do need to change storage tank filters more frequently as biodiesel can remove deposits when first storing higher blends.

Bus Driver Experiences

- Johnston bus drivers not told of the fuel switch. After four months, no comments. Seamless use.
- Nevada: “Our drivers love it.”
- Mechanics also excited about the fuel

Iowa Experiences

- Nevada fuel delivered from co-op as B50 in unheated, above-ground bulk tank. No issues with storage, pumping, separation.
- Nevada goal to run bus on B100 year-round. Will require a tank heater.

Biodiesel

- Pure biodiesel will gel in very cold temperatures, just as common #2 diesel does.
- Although pure biodiesel has a higher cloud point than #2 diesel fuel, typical blends of 20% biodiesel use the same fuel management techniques as #2 diesel during winters.
- Blends of 5% biodiesel and less have virtually no impact on cold flow.

For more information

- National Biodiesel Board. www.biodiesel.org
- Alternative Fuels Data Center www.afdc.nrel.gov
- Richard Scott, Transportation Director, Nevada Iowa Community School District, 515-382-4067
- http://www.epa.gov/otaq/consumer/fuels/altfuels/420f00032.pdf